

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application of: Prammer et al.

Serial No.: To be assigned

Group Art Unit: To be assigned

Filed: Herewith

Examiner: To be assigned

For: METHOD AND APPARATUS FOR  
NUCLEAR MAGNETIC RESONANCE  
MEASURING WHILE DRILLING

Attorney Docket No.: 007420-0088-999

**INFORMATION DISCLOSURE STATEMENT**

Commissioner for Patents  
Washington, D.C. 20231

Sir:

In accordance with the duty of disclosure provisions of 37 C.F.R. §1.56, there is hereby provided certain information which the Examiner may consider material to the examination of the subject U.S. patent application. It is requested that the Examiner make this information of record if it is deemed material to the examination of the application.

1. Enclosures accompanying this Information Disclosure Statement are:

- 1a. ☒ A list of all patents, publications, applications, or other information submitted for consideration by the office.
- 1b. A legible copy of :
  - ☐ Each U.S. patent application publication and U.S. and foreign patent;
  - ☐ Each publication or that portion which caused it to be listed on the PTO-1449;
  - ☐ For each cited pending U.S. application, the application specification including the claims, and any drawing of the application, or portion of the application which caused it to be listed on the PTO-1449 including any claims directed to that portion;
  - ☐ all other information or portion which caused it to be listed on the PTO-1449.
- 1c. ☐ An English language copy of search report(s) from a counterpart foreign application or PCT International Search Report.
- 1d. ☐ Explanations of relevancy (ATTACHMENT 1(d), hereto) or English language abstracts of the non-English language publications.

2. ☒ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(b):

- ☐ Within three months of the filing date of a national application other than a continued prosecution application under §1.53(d);
- ☐ Within three months of the date of entry of the national stage as set forth in §1.491 in an international application;

- ☒ Before the mailing of the first Office action on the merits;
- ☐ Before the mailing of a first Office action after the filing of a request for continued examination under §1.114.

3. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(c) after the period specified in 37 C.F.R. §1.97(b), but before the mailing date of any of a final action under 37 C.F.R. §1.113, a notice of allowance under 37 C.F.R. §1.311 or an action that otherwise closes prosecution in the application.

*(Check either Item 3a or 3b)*

- 3a. ☐ The Certification Statement in Item 5 below is applicable. Accordingly, no fee is required.
- 3b. ☐ The \$180.00 fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is:
- ☐ enclosed
  - ☐ to be charged to Pennie & Edmonds LLP Deposit Account No. 16-1150.

*(Item 3b to be checked if any reference known for more than 3 months)*

4. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(d) after the period specified in 37 C.F.R. §1.97(c), but on or before the date of payment of the issue fee.

The \$180.00 fee set forth in 37 C.F.R. §1.17(i)(1) is:

- ☐ enclosed.
- ☐ to be charged to Pennie & Edmonds LLP Deposit Account No. 16-1150.

The Certification Statement in Item 5 below is applicable.

5. ☐ Certification Statement *(applicable if Item 3a or Item 4 is checked)*

*(Check either Item 5a or 5b)*

- 5a. ☐ In accordance with 37 C.F.R. §1.97(e)(1), it is certified that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.
- 5b. ☐ In accordance with 37 C.F.R. §1.97(e)(2), it is certified that no item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the undersigned after making reasonable inquiry, was known by any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement.

6. ☒ This application is a continuation application under 37 C.F.R. §1.60 or §1.53(b) or (d).

*(Check appropriate Items 6a, 6b and/or 6c)*

- 6a. ☐ A Petition to Withdraw from issue under 37 C.F.R. §1.313(b)(5) is concurrently filed herewith.

- 6b. ☒ Copies of publications listed on Form PTO-1449 from prior application Serial No. 09/232,072, filed on January 15, 1999, of which this application claims priority under 35 U.S.C. §120, are not being submitted pursuant to 37 C.F.R. §1.98(d).
- 6c. ☐ Copies of the publications listed on Form PTO-1449 were not previously cited in prior application Serial No. , filed on , and are provided herewith.
7. ☐ This is a Supplemental Information Disclosure Statement. (*Check either Item 7a or 7b*)
- 7a. ☐ This Supplemental Information Disclosure Statement under 37 C.F.R. §1.97(f) supplements the Information Disclosure Statement filed on \_\_. A bona fide attempt was made to comply with 37 C.F.R. §1.98, but inadvertent omissions were made. These omissions have been corrected herein. Accordingly, additional time is requested so that this Supplemental Information Disclosure Statement can be considered as if properly filed on \_\_.
- 7b. ☐ This Supplemental Information Disclosure Statement is timely filed within one (1) month of a PTO Notice under 37 C.F.R. §1.97(i).
8. ☐ In accordance with 37 C.F.R. §1.98, a concise explanation of what is presently understood to be the relevance of each non-English language publication is:
- (*Check Item 8a, 8b, or 8c*)
- 8a. ☐ satisfied because all non-English language publications were cited on the enclosed English language copy of the PCT International Search Report or the search report from a counterpart foreign application indicating the degree of relevance found by the foreign office.
- 8b. ☐ set forth in the application.
- 8c. ☐ enclosed as an attachment hereto.
9. ☒ The Commissioner is authorized to charge any additional fee required or credit any overpayment for this Information Disclosure Statement and/or Petition to Pennie & Edmonds LLP Deposit Account No. 16-1150.
10. ☒ No admission is made that the information cited in this Statement is, or is considered to be, material to patentability nor a representation that a search has been made (other than a search report of a foreign counterpart application or PCT International Search Report if submitted herewith). 37 C.F.R. §§1.97(g) and (h).

Respectfully submitted,

*Ognyan V. Shentov, R.N. 38,051*

*for Francis E. Morris*

Date 07/31/01

Francis E. Morris  
PENNIE & EDMONDS LLP

24,615  
(Reg. No.)

## LIST OF REFERENCES CITED BY APPLICANT

(Use several sheets if necessary)

ATTY. DOCKET NO.

007420-0088-999

SERIAL NO.

N/A

APPLICANT

MANFRED G. PRAMMER *et al.*

FILING DATE

Herewith

GROUP

N/A

## U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA	6,008,646	12/28/99	Griffin <i>et al.</i>	324	303	
	AB	5,992,519	11/30/99	Ramakrishnan <i>et al.</i>	166	250.15	
	AC	5,977,768	11/02/99	Sezginer <i>et al.</i>	324	303	
	AD	5,914,598	06/22/99	Sezginer <i>et al.</i>	324	303	
	AE	5,869,755	02/09/99	Ramamoorthy <i>et al.</i>	73	152.05	
	AF	5,796,252	08/18/98	Kleinberg <i>et al.</i>	324	303	
	AG	5,705,927	01/06/98	Sezginer <i>et al.</i>	324	303	
	AH	5,680,043	10/21/97	Hurlimann <i>et al.</i>	324	303	
	AI	5,629,623	05/13/97	Sezginer <i>et al.</i>	324	303	
	AJ	5,565,775	10/15/96	Stallmach <i>et al.</i>	324	303	
	AK	5,557,201	09/17/96	Kleinberg <i>et al.</i>	324	303	
	AL	5,557,200	09/17/96	George R. Coates	324	303	
	AM	5,517,115	05/14/96	Prammer	324	303	
	AN	5,498,960	03/12/96	Vinegar <i>et al.</i>	324	303	
	AO	5,497,087	03/05/96	Vinegar <i>et al.</i>	324	303	
	AP	5,486,762	01/23/96	Freedman <i>et al.</i>	324	303	
	AQ	5,486,761	01/23/96	Sezginer	324	303	
	AR	5,432,446	07/11/95	Macinnis <i>et al.</i>	324	303	
	AS	5,412,320	05/02/95	Coates	324	303	
	AT	5,387,865	02/07/95	Jerosch-Herold <i>et al.</i>	324	303	
	AU	5,381,092	01/10/95	Robert Freedman	324	303	
	AV	5,379,216	01/03/95	Elton L. Head	364	422	
	AW	5,376,884	12/27/94	Abdurrahman Sezginer	324	303	
	AX	5,363,041	11/08/94	Sezginer	324	303	
	AY	5,350,925	09/27/94	Charles C. Watson	250	269.3	
	AZ	5,349,184	09/20/94	Peter D. Wraight	250	266	
	BA	5,309,098	05/03/94	Coates <i>et al.</i>	324	303	
	BB	5,280,243	01/18/94	Miller	324	303	
	BC	5,212,447	05/18/93	Paltiel	324	300	
	BD	5,122,746	06/16/92	King <i>et al.</i>	324	307	
	BE	5,055,788	10/08/91	Kleinberg <i>et al.</i>	324	303	
	BF	5,055,787	10/08/91	Kleinberg <i>et al.</i>	324	303	

	BH	4,933,638	06/12/90	Kenyon <i>et al.</i>	324	303	
	BI	4,728,892	03/01/88	Vinegar <i>et al.</i>	324	309	
	BJ	4,717,878	01/05/88	Taicher <i>et al.</i>	324	303	
	BK	4,717,877	01/05/88	Taicher <i>et al.</i>	324	303	
	BL	4,717,876	01/05/88	Masi <i>et al.</i>	324	303	
	BM	4,710,713	12/01/87	Taicher <i>et al.</i>	324	303	
	BN	4,885,540	12/05/89	Snoddy <i>et al.</i>	324	318	
	BO	4,686,364	08/11/87	Susan L. Herron	250	256	
	BP	4,528,508	07/09/85	William B. Vail, III	324	303	
	BQ	4,310,887	01/12/82	Jean A. Suau	364	422	
	BR	3,896,668	07/29/75	Anderson <i>et al.</i>	73	152	
	BS	3,784,898	01/08/74	Darley <i>et al.</i>	324	0.5R	
	BT	3,777,560	12/11/73	Jean-Hubert Guignard	73	151.5	
	BU	3,667,035	05/30/72	Charles P. Slichter	324	0.5R	
	BV	3,657,730	04/18/72	Robinson <i>et al.</i>	324	0.5	
	BW	3,638,484	02/01/72	Maurice P. Tixier	73	152	
	BX	3,617,867	11/02/71	Gerherd Herzog	324	0.5	
	BY	3,593,116	07/13/71	Willie C. Culpepper	324	0.5	
	BZ	3,590,228	06/29/71	Jack A. Burke	235	151.35	
	CA	3,567,936	03/02/71	Jay Tittman	250	83.1	
	CB	3,567,935	03/02/71	Walter A. Nagel	250	83.1	
	CC	3,508,438	04/28/70	Alger <i>et al.</i>	73	152	
	CD	3,453,433	07/01/69	Alger <i>et al.</i>	250	83.3	
	CE	3,402,344	08/02/65	Brown <i>et al.</i>			
	CF	3,395,337	01/03/52	R. H. Varian			
	CG	3,360,716	08/06/56	Bloom <i>et al.</i>			
	CH	3,213,357	10/19/65	Brown <i>et al.</i>			
	CI	3,205,477	09/07/65	D. C. Kalbfell			
	CJ	1,158,959	11/02/15	E. W. Beach			
	CK	Re. 32,913	04/25/89	Brian Clark	324	338	

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		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
							YES	NO
	CL	0 649 035 B1	04/19/95	European Patent Application	G01V	3/32		
	CM	0 581 666 A3	02/02/94	European Patent Application	G01V	3/32		

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)		
	CN	International Publication Number WO 98/25164, Publication Date 06/11/98; from International Application Number PCT/US97/21889, Filed 11/26/97; Priority Data: Serial No. 08/759,829, Filed 12/04/96.
	CO	Morriss <i>et al.</i> , "Hydrocarbon Saturation and Viscosity Estimation from NMR Logging in the Belridge Diatomite," 35th SPWLA Annual Logging Symposium (June 19-22, 1994), pp. 1-24.
	CP	Carr <i>et al.</i> , "Effects of Diffusion on Free Precision in Nuclear Magnetic Resonance Experiments," <i>Physical Review</i> , Vol. 94. No. 3 (May 1, 1954), pp. 630-638.
	CQ	<i>Schlumberger Wireline &amp; Testing</i> , "Combinable Magnetic Resonance tool reliably indicates water-free production and reveals hard-to-find pay zones," (June 1995).
	CR	Morriss <i>et al.</i> , "Field Test of an Experimental Pulsed Nuclear Magnetism Tool," SPWLA Annual Logging Symposium (June 13-16, 1993), pp. 1-23.
	CS	Coates <i>et al.</i> , "Core Data and the MRIL Show - A New Approach to 'Formation Factor,'" National SPWLA Convention (June 15, 1992), pp. 1-15.
	CT	Kleinberg <i>et al.</i> , "Novel NMR Apparatus for Investigating an External Sample," <i>Journal of Magnetic Resonance</i> , (1992) pp. 466-485.
	CU	Coates <i>et al.</i> , "An Investigation of a New Magnetic Resonance Imaging Log," National SPWLA Convention (June 18, 1991), pp. 1-24.
	CV	Howard <i>et al.</i> , "Proton Magnetic Resonance and Pore-Size Variations in Reservoir Sandstones," <i>Society of Petroleum Engineers</i> (1990), pp. 733-741.
	CW	Miller <i>et al.</i> , "Spin Echo Magnetic Resonance Logging: Porosity and Free Fluid Index Determination," <i>Society of Petroleum Engineers</i> (1990), pp. 321-334.
	CX	Kenyon <i>et al.</i> , "Pore-Size Distribution and NMR in Microporous Cherty Sandstones," SPWLA Thirtieth Annual Logging Symposium (June 11-14, 1989), pp. 1-24.
	CY	<i>Schlumberger Technology News - Oilfield Bulletin</i> , "Fifth Generation Nuclear Magnetic Resonance Logging Tool: A Major Advance in Producibility Measurement Technology," (July 1995) (2 pp.)
	CZ	Akkurt <i>et al.</i> , "NMR Logging of Natural Gas Reservoirs," SPWLA 35th Annual Logging Symposium (June 26-29, 1995)
	DA	Prammer, M.G., "NMR Pore Size Distributions and Permeability at the Well Site," <i>Society of Petroleum Engineers</i> (9/25/95) pp. 55-64.
	DB	Chandler <i>et al.</i> , "Improved Log Quality with a Dual-Frequency Pulsed NMR Tool," <i>Society of Petroleum Engineers</i> (1994) pp. 23-35.
	DC	Straley <i>et al.</i> , "NMR in Partially Saturated Rocks: Laboratory Insights on Free Fluid Index and Comparison with Borehole Logs," SPWLA Annual Logging Symposium (June 27, 1991) pp. 40-56.
	DD	Gallegos <i>et al.</i> , "A NMR Technique for the Analysis of Pore Structure: Determination of Continuous Pore Size Distributions," <i>Journal of Colloid and Interface Science</i> , Vol. 122, No. 1, March 1988, pp. 143-153.
	DE	Gallegos <i>et al.</i> , "A NMR Technique for the Analysis of Pore Structure: Application to Materials with Well-Defined Pore Structure," <i>Journal of Colloid and Interface Science</i> , Vol. 119, No. 1, September 1987, pp. 127-140.
	DF	Neuman <i>et al.</i> , "Applications of Nuclear Magnetism Logging to Formation Evaluation," <i>Journal of Petroleum Technology</i> , Vol. 34, (1982) pp. 2853-2862.
	DG	Chandler <i>et al.</i> , "Reliable Nuclear Magnetism Logging - With Examples in Effective Porosity and Residual Oil Saturation," SPWLA - 28th Annual Logging Symposium, Vol. 1, Manuscript C, (1987).

	DH	Jackson <i>et al.</i> , "Western Gas Sands Project Los Alamos NMR Well Logging Tool Development," Los Alamos National Laboratory (October 1981 - September 1982) pp. 1-28.
	DI	Clavier <i>et al.</i> , "The Theoretical and Experimental Bases for the 'Dual Water' Model for the Interpretation of Shaly Sands," <i>Journal of Petroleum Technology</i> (April 1984), pp. 3-15.
	DJ	Petrakis <i>et al.</i> , "The Utilization of Nuclear Magnetic Resonance Spectroscopy for Petroleum, Coal, Oil Shale, Petrochemicals, and Polymers. Phenomenology, Paradigms of Applications, and Instrumentation," 594 <i>Applied Spectroscopy Reviews</i> Vol. 15 (1979) No. 2, pp. 195-260.
	DK	Brownstein <i>et al.</i> , "Importance of classical diffusion in NMR studies of water in biological cells," <i>The American Physical Society</i> , Vol. 19, No. 6, (1979) pp. 2446-2453.
	DL	Farrar <i>et al.</i> , "Pulse and Fourier Transform NMR Introduction to Theory and Methods," Academic Press (1971) pp. 26-29.
	DM	Waxman <i>et al.</i> , "Electrical Conductivities in Oil-Bearing Shaly Sands," <i>Society of Petroleum Engineers Journal</i> (1968) pp. 107-122.
	DN	Brown <i>et al.</i> , "Nuclear Magnetism Logging," <i>Transactions of the American Institute of Mining, Metallurgical, and Petroleum Engineers</i> , Vol. 219 (1960), pp. 199-207.

EXAMINER	DATE CONSIDERED
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	